

# Wing (C. S.)

## POISONING BY NITRO-BENZOLE.\*

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[Nitro-benzole (commonly known as essence or oil of Mirbane) is now largely employed by soap manufacturers, perfumers and confectioners, and is used to some extent in household kitchens as a substitute for oil of bitter almonds. It has been introduced into medicine, and is stated to be, when diluted with glycerine and applied locally, an efficient remedy for scabies.

It is formed by the action of nitric acid upon benzole (a product of the distillation of coal tar), and is an oily, yellowish, intensely sweet liquid, with an odor resembling—but not identical with—that of bitter almonds. Density, 1,209; boiling point, 415°; represented (old nomenclature) by the formula  $C_{12}H_5O_4N$ . It is largely used in the manufacture of aniline colors, being transformed by simple chemical processes, by the removal of oxygen and the addition of hydrogen, into aniline,  $C_{12}H_7N$ .

Aniline, treated in different ways with various oxidizing reagents, yields the dyes known as aniline colors. Their chemical composition has been investigated by Hoffman. They are understood to result from the oxidation of a portion of the hydrogen of the aniline, the color of the new compounds varying with the character and relative proportion of the oxidizing agent employed.]

M. P., æt. 26, single, longshoreman, was at work in the hold of a vessel, May 20th, when, shortly after 7 o'clock, A. M., a package of nitro-benzole sent up in the sling fell and burst, its contents being scattered about the hold, and a considerable quantity falling over his frock and shirt. As he stated, it "smelled fearful strong," but "didn't choke at all." Some of his fellow-workmen were obliged to leave the hold and go above for fresh air; but he, with some others, continued to work in the same place, although only one other remained as long as he.

The patient did not feel at all sick until after returning from his house at noon; but it was remarked that he looked "pale and blue" as early as 11 o'clock. He continued to work until nearly 3 o'clock, his companions several times telling him that he was looking very badly, when, growing sicker and "feeling heavy and dizzy in his head," he went to a liquor store near at hand for a glass of brandy, which was vomited soon after being taken. He then started out to find a doctor, but, growing worse, was finally helped home to his boarding place, having to sit down and rest several times on the way. Patient knew nothing more until he found himself at the hospital.

The barkeeper of whom he obtained the drink of brandy stated of him that "he had seen many dead men, but never one who looked as badly as he. He looked as though there was not a drop of blood in his body, and the color of his face was like that of one's hands when held before a green dress." He also noticed "a peculiar smell about him," and that he seemed very weak.

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Soon after he arrived at his house, he was seen by Dr. McDonald, of this city, to whose kindness I am indebted for an account of his condition at that time. He found him "in a semi-comatose condition, roused with difficulty, answering questions incoherently, very livid all over, extremities cold, pulse slow and full, breathing difficult but not stertorous, and whole body bathed in perspiration." The clothing about him and vomited matter emitted a strong smell of bitter almonds. On being "shaken up," his pulse improved, and breathing became somewhat less laborious. He was ordered an emetic, to be followed by brandy and ammonia (though whether he received anything from his stupid and indifferent friends is doubtful), and directed to be taken to the City Hospital, where he was brought about 5 o'clock, P.M. The only history to be obtained from those bringing him was, that "he had breathed fumes from a broken package early in the morning," as above.

When first seen, he was lying in the accident room of the hospital, with marked pallor of the face, and at the same time a noticeable and peculiar blueness of the prolabia and of the fingers and fingernails. His breath and clothing emitted a peculiar odor, which seemed familiar, and it occurred to me that it was the same with that constantly pervading the clothes of a friend who was engaged in an aniline manufactory. A short hunt through the books enabled me to fix upon nitro-benzole as the probable poisonous agent, and this it afterwards proved to be.

He had received half an ounce of brandy from the ward-master on his entrance.

On loud questioning patient roused somewhat, appeared perfectly rational, and stated that he "had swallowed nothing, only breathed the fumes." Pulse was 100, feeble, and respiration slow and very feeble. Pupils dilated, and not responding to light. Artificial respiration was attempted, without much result, and patient was ordered carb. ammonia and placed in a hot bath, at the same time receiving a cold douche upon the head. When taken out, he was vigorously rubbed with coarse towels from head to foot. At the same time he vomited a portion of the brandy taken on entrance. Pulse now 120, of good strength. Respiration 28, quite strong, and countenance more natural. After a while his symptoms grew worse. Bath was repeated, and afterwards the patient was wrapped in blankets and stimulated freely with brandy and carb. ammonia by enemata, the stomach rejecting stimulants taken by the mouth.

At 7.30 P.M., pulse 112, and again very feeble. Resp. 18, and very irregular, a long, slow breath being followed by several shorter and quicker, and the patient could hardly be roused by repeated hard slaps with wetted towel on chest and face, muttering to be "let alone," and again relapsing into an unconscious state.

8.20, P.M.—Pulse and respiration the same, but patient more easily roused.

10.30, P.M.—Pulse 104, resp. 22, still irregular, but patient easily roused, perfectly rational, and able to relate the circumstance of his attack. Right pupil responding to light, but left immovably dilated.

Next morning.—Pulse 98, resp. 22. Pupils normal. Patient still pale and bluish, but states that he is “all right.” Soon after, he left the hospital, returning in a few days to report himself. “Still a little dizzy and not quite himself,” but expecting to go to work in a day or two. Bluish color about the mouth still noticeable. Since that time nothing has been heard from him, and doubtless his recovery was perfect.

The ward which he occupied was strongly scented for several days after he left with the peculiar odor of nitro-benzole.

The man who worked by his side in the hold showed no symptoms of poisoning, although he worked in the same place and for the same length of time, and also had some of the liquid spilt upon his clothing.

Three other men worked for about two hours in the hold, at the time; upon two no effect was produced, except that of a local irritant where the liquid fell upon the skin; the third man felt dizzy, and it was noticed that he was “pale and blue.”

In an essay “On the Physiological Properties of Nitro-benzole and Aniline” (*London Hospital Reports*, Vol. 2), Mr. Letheby writes as follows:—

“It is on record that Thrasyas, the father of botany, was so skilled in the preparation of drugs that he knew how to compound a poison which would remain for days in the living body without manifesting its action, and would at last kill by a lingering illness. \* \* \* \* \* Modern toxicologists have long since discarded these notions, and have set them down to the vague fears and exaggerated fancies of the ancients rather than to the sober contemplation of fact; but the account which I am about to give of the physiological properties of nitro-benzole will show that there is one substance at least, which realizes to a great degree, the extraordinary opinions of the ancients. The compound may be given to-day, and yet, if the dose be not too large, it shall not manifest its action until to-morrow or the day after, and then shall destroy life by a lingering illness, which shall not only defy the skill of the physician, but shall also baffle the researches of the medical jurist. These facts are so remarkable that they would be hardly credited if they were not susceptible of the proof of demonstration. They are likewise the more interesting and important from the circumstance that nitro-benzole is now a common article of commerce and is accessible to everyone.

According to our author, the narcotic effect of nitro-benzole and aniline are frequently noticed among workmen in establishments where they are manufactured; but usually the symptoms are not serious, and are readily dispelled by fresh air or a mild stimulant. He records, however, several fatal cases by nitro-benzole, viz. —

A man, æt. 43, spilled a quantity of the liquid over the front of his clothes, and went about for several hours in an atmosphere saturated with the poison. In another case, a boy, æt. 17, received a little of the liquid into his mouth while sucking at a syphon.

The effects were nearly the same in both cases, notwithstanding that in one the poison was inhaled and in the other it was swallowed. For some time there was no feeling of discomfort beyond that of drowsi-

ness ; gradually, however, the face became flushed, the expression stupid, and the gait unsteady. The sufferers had the appearance of persons who had been drinking. Little by little the stupor increased until it passed into profound coma, and in this condition they died. The progress of each case was much the same as that of slow intoxication, excepting that the mind was perfectly clear until the coming on of the fatal coma, which was sudden, and in which "the sufferer lay as in a deep sleep, and died without a struggle." The duration of each case was nearly the same ; about four hours elapsed from the time of taking or inhaling the poison to the setting in of the coma, and the coma itself lasted four or five hours. At the *post mortem* there was found congestion of the brain, and the blood was "everywhere black and fluid. The liver was of a purple color. Analysis discovered the existence of nitro-benzole in the brain and stomach, and also of aniline."

In a third case, a clerk in a chemical manufactory, at about noon, applied a drop or two of nitro-benzole to his tongue to take away the odor of a pipe which he had been smoking, repeating the same an hour and a half afterwards, the latter time also swallowing a drop or two of the liquid. He felt prostrated after the first dose, and took an alcoholic stimulant, but an hour after the second dose was worse, and was seen by a physician, who found him excited, his face purplish and his lips and nails mauve colored. Skin cold. Resp. short and quick, with feeling of suffocation. Heart's action irregular. Pulse 130, weak and irregular. Complaining of oppression at chest and confusion in head. At half past three, he was seized with convulsions (emprosthotonos), repeated in twenty minutes, both convulsions quickly passing off, cold water being dashed over him. Soon after, a third convulsion occurred, leaving patient in a state of coma, in which he remained for six hours, consciousness then gradually returning after an enema of turpentine. Pulse remained weak, irregular and frequent. Patient complained of great thirst, and drank much strong coffee. He remained sensible to the last, finally dying by exhaustion, fifteen hours after the last dose of the poison.

On *post mortem*, there was found congestion of the brain and also of the spinal cord. The lips were still livid, but the mauve color of the nails had diminished since death. All cavities of the heart, coronary vein, venæ cavæ and pulmonary artery were fully distended with black, coagulated blood, and the lungs were much congested ; abdominal organs normal.

In this case the patient was certain that he had not swallowed more than three or four drops of the poison, and from the fact that the tube in which he had the liquid was found nearly full, he could not have taken more than eight or nine drops.

A servant boy, æt. 13, tasted some "artificial essence of bitter almonds" (nitro-benzole), which had been used to scent pomatum, but finding the taste unpleasant spat out, and "did his best to prevent any from being swallowed." The cook in the family also tasted, but did not swallow any. Soon after both ate dinner.

In about an hour from the time of tasting the poison, the cook felt unwell, suffered from palpitation of the heart (being a subject of heart

disease), vomited—the vomited matter smelling strongly of nitro-benzole—became insensible, and fell from her chair. She remained quite insensible several hours. Her face was puffed and of a leaden hue, and lips swollen and livid. Skin moderately warm. Pulse regular, but feeble. Patient recovered under alcoholic stimulant, “but there was a remarkable discoloration of the skin of the face and chest for many hours after.”

The boy was not affected for six hours after, in the meantime having taken his mistress out to drive. He then vomited—vomited matter smelling of nitro-benzole—became drowsy, stupid, and at 8 o'clock was quite insensible. Face livid, lips almost black, teeth firmly clenched, pulse intermittent and feeble. Brandy was given freely, and patient seemed to rally for a while, but soon after relapsed, and died in complete coma, ten hours and a half after taking the poison. No examination *post mortem* was made.

These cases led Mr. Letheby to experiment upon animals, a brief *résumé* of which experiments is here given:—

“From 30 to 60 drops were given by the mouth to dogs and cats. There was rarely vomiting or other sign of gastric irritation. Two classes of effects were noticed—either rapid coma, or a slow occurrence of palsy and coma after a period of apparent inaction of the poison. Even in the *rapidly comatose* cases paralytic symptoms were noticed in the earlier stage. The time varied in *these* cases from twenty-five minutes to twelve hours between the exhibition of the poison and death.

“In the *slower* cases, there was no visible effect for hours and sometimes for days. Suddenly, however, the animal would be attacked with vomiting, followed by convulsions, which on their subsidence left more or less paralysis, first of the hinder and then of the fore limbs. After this, the animal generally lay for days more or less conscious, with now and then epileptic attacks, and at length died of exhaustion, or gradually recovered.

“The time from the exhibition of the poison to the first epileptic fit was from nineteen to seventy-two hours, in most cases about two days, and to the period of death was from four to nine days. This apparent inaction of the poison at first is very extraordinary, almost justifying a belief in cases of poisoning said to have occurred in ancient times.”

Marked dilatation of the pupil was noticed in some of these cases. The *post mortem* appearances were much the same as in the fatal cases in man reported by the same observer, and there was the same purple tint of the liver as found in the first two cases he reports. In the *rapidly fatal* cases, the odor of nitro-benzole was noticeable, and aniline was found in the organs. In some of the *slower* cases, the odor was gone, but in nearly all aniline was found in some parts of the body, though in a few instances no poison whatever was found. Mr. Letheby also made experiments upon animals with *aniline*, the effects of which were apparently identical with the *rapid effects* of nitro-benzole. Aniline was readily discernible in the tissues *post mortem*.

As a result of his experiments he draws the following conclusions:—

1st. That nitro-benzole, and aniline in its free state, are powerful narcotic poisons.

2d. That they excite but little action as local irritants on the stomach and bowels.

3d. That although the effects of them may be quick and the termination of them rapid, yet nitro-benzole may remain in the system for a long time without manifesting its action.

4th. That the salts of aniline are not nearly as poisonous as the free alkali.

5th. That in rapid cases of fatal poisoning, both the poisons are readily discovered in the dead body.

6th. That in slow cases the poison may be entirely changed or eliminated, and therefore not recognizable.

7th. That both of the poisons appear to be changed in the body by the process of oxidation and reduction, nitro-benzole being changed into aniline, and aniline and its salts into mauve or magenta.

Dr. Alfred S. Taylor, under the heading "Cases and Observations in Medical Jurisprudence" (*Gay's Hosp. Reports*, 1864), refers to the experiments of Mr. Letheby upon animals, and also speaks of the odor of nitro-benzole being in one case plainly perceptible from the body of the animal fourteen days after death. He also refers to a paper by Mr. Nicholson, published in *The Lancet*, Oct. 1, 1862, in which the writer states that he has known several instances in which the vapor of nitro-benzole, as evolved from "*almond glycerine soap*," scented with it, has seriously affected females. A friend of his who used a cake of the soap in taking a warm bath, fainted from the effects of nitro-benzole set free, and was ill for some time afterwards.

Mr. Taylor records the case of a woman who tasted nitro-benzole by mistake, but at once spat it from her mouth, though she continued to breathe the vapor of some spilled upon the floor. When seen, was pale and ghastly, "lips and nails purple, as if stained by blackberries," but the patient's mind was clear, and she described the nature of the accident, but afterwards lost her consciousness. Her teeth became set, the hands clenched and blue, the muscles rigid and convulsed. In about eleven hours there was reaction, and in seventeen the patient was much better, though she continued feeble for some weeks.

A person in the same room with the above suffered from inhaling the vapor from the liquid spilled on the floor.

Nitro-benzole, according to Mr. Taylor, is distinguished from all other liquids, except the essential oil of almonds, by its odor, and from the oil by the fact that strong sulphuric acid added to it produces no color, while with essential oil of almonds a rich crimson color, with a yellow border, is produced. He also states that, so far as cases have been observed in man in poisoning, either by the liquid or vapor, narcotic symptoms have appeared comparatively soon. Both Mr. Taylor and Mr. Letheby describe processes for detection of the poison *post mortem*.

The effects of *aniline* as such upon the system have frequently been noticed.

Mr. Letheby records the case of a boy who was brought to the London Hospital in 1861, having breathed fumes of aniline, and who was suddenly seized by dizziness and insensibility; he was brought to the

hospital in that condition, with cold surface, feeble pulse and laborious breathing. After a while he rallied, and "it was then noticed that his face had a purple hue, and that the lips and lining membrane of the mouth, and the nails, had the same purple tint." The color remained next day, "patient looking like a patient in last stage of cholera," otherwise his symptoms had disappeared.

Another case is referred to in the *Pharmaceutical Journal*, vol. 4, p. 42, where a man spilled some aniline upon his clothes and breathed the vapor for several hours. When seen, several hours afterwards, "his body was of a leaden, livid hue; lips, gums, tongue and eyes, of corpse-like, bluish pallor, and breath gasping." He recovered with vigorous stimulation, though the peculiar color was noticeable for some time.

The same peculiar coloring of the features has been noticed at the London Hospital, in patients taking sulphate of aniline, given in cases of cholera, the color fading some time after a dose, and reappearing with the next. Dr. Turnbull, of Liverpool, in a paper on Properties of Sulphate of Aniline, has also noted the remarkable effect it has on the color of the lips and skin.

After reading the reported cases of poisoning by nitro-benzole, it seems strange that certain authorities should have asserted that it is not poisonous; and in view of what is now known of its properties, such assertions must go for naught. Certain it is, however, that the action varies considerably with the patient, or is modified by unseen influences, as in the case of the man mentioned in this article, the companion of the patient who, although as near as could be learned under exactly the same conditions, had no symptoms whatever.

By an accident occurring in this city a few years ago, of which I was cognizant, two gentlemen were drenched with a mixture of aniline and nitro-benzole, and breathed the vapors for a considerable time afterwards, yet upon neither was any effect produced, except that one had a severe attack of conjunctivitis, the liquid having fallen in his eyes.

The subject has attracted considerable attention abroad, but, as far as I know, as yet, very little in this country, and no reported cases occurring this side of the water have fallen under my observation, though very likely there have been such. It certainly is interesting as exemplifying in a most striking manner the chemical changes constantly going on in the living organism, and is, moreover, important to the medical practitioner, from the fact that the statement made in England several years ago, that "nitro-benzole is now a common article of commerce, and accessible to everyone," is, to-day, true in America.

Dr. EWALD, of Berlin, has found in poisoning animals with nitro-benzole, that temporary glycosuria results, and in the Berlin "Klinische Wochenschrift," of Jan. 4, 1875, reports two cases of attempted suicide occurring in the clinic of Prof. Frericho, which show that the same effect is produced on mankind in some cases at least. At the end of his article is a list of all the cases published up to that time, including our own, to which he calls attention as proving that the most serious symptoms may be present, and yet speedy and complete recovery follow—a fact of prognostic value. It is curious that in France, where nitro-benzole is in quite common use, no cases of poisoning are reported.

